



BALANCING

Incentives and Risks

in Performance-Based Contracts



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Performance-Based Life Cycle Support (PBL) as a sustainment strategy for weapon systems has been mandated by the Department of Defense (DoD) and employed by acquisition and contracting professionals in both government and private industry. Despite its apparent success, DoD implementers of PBL often face an inherent conflict: the PBL goal of developing long-term partnerships that encourage investment from commercial partners is best achieved through lengthy, guaranteed contracts—but such contracts increase the DoD's risk in an environment that is intended to transfer more risk to the contractor. This exploratory research examines issues associated with the type and length of PBL contracts, addressing the question of how the DoD can balance PBL contracts mitigating operational and financial risks while simultaneously building long-term partnerships that encourage investment from commercial contractors. The results reveal five areas in which the government should focus its efforts to improve PBL implementation.

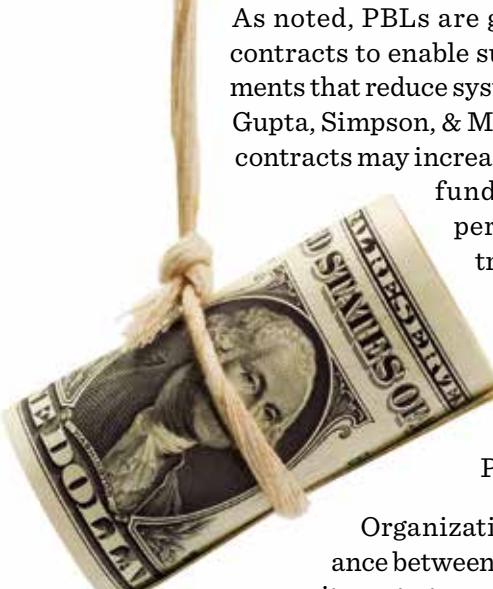
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The current preferred product sustainment strategy for improving weapon systems readiness within the Department of Defense (DoD) is known as performance-based life-cycle support (or Logistics; PBL) (Acquisition Community Connection [ACC], 2013; DoD, 2013). Unlike traditional strategies, PBL shifts “from buying iterative discrete quantities of goods and services (transactional logistics) to acquiring sustainment via top-level outcomes” (Fowler, 2009, p. 10). By focusing on the purchase of outcomes rather than transactions, PBL strategies incentivize the providers to invest in their logistics infrastructure to reduce total system life-cycle costs while simultaneously meeting system performance and support (Kim, Cohen, & Netessine, 2007; Randall, Nowicki, & Hawkins, 2011).

Background

Under the old transactional strategy, when a firm contracted to supply, for example, aircraft parts, they profited from every part sold, but also had no inherent incentive to improve the product. The incentive was to maximize the sale of parts. Under a PBL strategy, that company may now be responsible for providing availability or up-time. This change shifts that company’s incentive away from volume and towards quality. Paying the contractor a fixed price for availability encourages them to reduce the amount of parts used, increasing their margins (Geary & Vitasek, 2008). Some argue that PBL has, “for the first time in the history of DoD … aligned the interests of each link in the chain with the end-user—the warfighter” (Vitasek, Geary, Cothran, & Rutner, 2006, p. 7). A well-structured PBL contract maintains or improves performance, lowers costs to the government, and increases profits for the supplier (Randall, 2013).

PBL-based contracts are intended to shift risk away from the customer and move it to the supplier while simultaneously increasing the supplier’s potential for reward. In traditional support strategies, the risk rests with the government. By contracting for components (for instance, purchasing parts), the government risks increased failure rates, unavailability of parts, and obsolescence. To protect against these risks, the government typically increases purchase volume thereby increasing safety stock (Openshaw & Riffle, 2006). By purchasing a capability, the customer seeks to share these risks with the supplier. Suppliers can be incentivized to take on these risks in several ways, including a pricing model, rewards for reaching targets, provisions for exit criteria for both customer and supplier, work-scope flexibility, and finally, contract length (Geary & Vitasek, 2008).



As noted, PBLs are generally seen as providing long-term contracts to enable suppliers to invest in systemic improvements that reduce system costs over the long term (Berkowitz, Gupta, Simpson, & McWilliams, 2004–2005). However, such contracts may increase the DoD's risk through uncertainty of funding, operational tempo, and supplier performance (Mahon, 2007). While contracts of shorter term lengths may reduce risks for the government, the supplier's incentive to make significant up-front investments, providing long-term benefits for the system, is also reduced (Gupta, Eagan, Jones, & Platt, 2010).

Organizations face the challenge of finding a balance between mitigating their own risks while making commitments to commercial contractors that encourage affordable, long-term support. No study has yet been undertaken to broadly examine if DoD's current contracting strategies are achieving this balance. This research investigates the factors most important to decisions for PBL contract type and length, examining contracting trends in past and current PBL programs, and garnering the opinions of subject matter experts (SMEs) in both DoD and private industry. It seeks not to examine whether PBL is a viable sustainment technique, but rather to identify what steps can be taken to contractually improve PBL structure by moving the government closer to achieving the necessary balance. To address these issues, the following research question was investigated:

How can the DoD ideally balance PBL contracts to mitigate operational and financial risks while simultaneously building long-term partnerships that encourage investment from commercial contractors?

Subsequently, the authors established several investigative questions to guide the research and to frame the methodology:

1. What types and lengths of PBL contracts have proven most successful and effective to date?
2. What risks and other criteria most frequently play a role in determining PBL contract type and length?

3. Are contracts adequately structured to consistently meet the PBL goal of establishing long-term partnerships?
4. Are PBL contracts adequately structured to consistently provide incentives for contractors to make cost reductions in system support?
5. How satisfied are PBL experts in both DoD and private industry with the government's risk aversion in PBL contracts?
6. Would any significant benefits be gained if the maximum contract length allowed by the Federal Acquisition Regulation (FAR) were increased?
7. Are award term and option year contracting strategies being used effectively, and should their use continue in a lesser, similar, or greater capacity?
8. Should Working Capital Funds (WCF) be used more extensively in PBL programs?
9. Does a PBL agreement's place among the "Four Stages" (Vitasek et al., 2006, p. 7) of PBL have any impact on contract length decisions?

Literature Review

PBL Partnerships

The processes of acquisition and sustainment in the DoD have been continually evolving. The focus has shifted from organic development of technology emphasizing weapon effectiveness to commercial technology and sustainment strategies that increase performance while reducing costs over the life of systems. The DoD seeks to gain the most efficient and effective performance of systems throughout their entire life cycles and to align the goals of all involved organizations for the duration of the programs (Berkowitz et al., 2004–2005).

The DoD's use of PBL has shifted in recent years. In 2008, with the publishing of interim guidance for *Operation of the Defense Acquisition System* (DoD, 2008), the DoD altered PBL, redefining it as performance-based life-cycle support. This guidance stated that "Performance-Based Life-Cycle

Product Support represents the latest evolution of Performance-Based Logistics..." (DoD, 2008, p. 29). The DoD maintains that the two are synonymous and retains the PBL acronym (DoD, 2013).

Indeed, the Assistant Secretary of Defense for Logistics and Materiel Readiness published a memorandum titled "Performance Based *Logistics* Comprehensive Guidance" [italics added] at the end of 2013. Likewise, the academic literature, as demonstrated in two of the premier logistics journals—the *Journal of Business Logistics* and the *International Journal of Physical Distribution and Logistics Management*—published articles that still refer to PBL with logistics in the title (Glas, Hofmann, & Eßig, 2013; Randall et al., 2011). Finally, DoDI 5000.02, the most current version of the DoD's guidance on the operation of its acquisition system, requires program managers to "Employ effective performance-based logistics ... in developing a system's product support arrangements..." (DoD, 2015, p. 113). Since the DoD finds the two concepts synonymous, this work will use them interchangeably. The DoD acquisition community defines PBL (ACC, 2013) as:

An outcome-based product support strategy for the development and implementation of an integrated, affordable, product support package designed to optimize system readiness and meet the warfighter's requirements in terms of performance outcomes for a weapon system through long-term product support arrangements with clear lines of authority and responsibility. (para. 4)



This definition points to the establishment of long-term support arrangements (ACC, 2013). The literature suggests this as being an essential element of a successful PBL (Berkowitz et al., 2004–2005; Gupta et al., 2010; Randall, Pohlen, & Hanna, 2010). But mere length of time does not necessarily constitute a partnership (Lemke, Goffin, & Szwejczewski, 2003). The literature clarifies that these long-term relationships extend not only beyond simply the length of the contract, but also in the development of partnerships

(DeVries, 2005; Geary & Vitasek, 2008; Geary, Koster, Randall, & Haynie, 2010; Starks, 2004–2005; Vitasek et al., 2006). According to Lambert, Emmelhainz, and Gardner (1996, p. 2), “A partnership is a tailored business relationship based on mutual trust, openness, shared risk, and shared rewards that yields a competitive advantage, resulting in business performance greater than would be achieved by the firms individually.” Research suggests that organizations should look for ways to develop partnerships and integration to increase value (Ogden, Petersen, Carter, & Monczka, 2005). In this light, partnerships are often viewed as centrally important to the success of PBL programs (Randall et al., 2011; University of Tennessee, 2012). The core of the PBL strategy involves capitalizing on integrated logistics chains and public/private partnerships (DoD, 2013).

Contractual relationships that are largely transactional, involving minimal integration of operations between DoD and smaller support providers, are generally not considered to be performance-based contracts.

Partnerships can differ significantly and not all business relationships are truly partnerships (Daugherty, 2011). The same can be said of PBL within the context of DoD contracts. Contractual relationships that are largely transactional, involving minimal integration of operations between DoD and smaller support providers, are generally not considered to be performance-based contracts. In contrast, DoD and major defense contractors, such as Lockheed Martin and Boeing, increasingly enter into performance-based accords that display several characteristics of partnerships (Goure, 2009; Office of the DoD Inspector General, 2006). The rationale for entering into partnerships is based on perceived benefits (Daugherty, 2011) and, in fact, firms should enter into a partnership only if they cannot achieve said benefits without the partnership (Lambert & Knemeyer, 2004). The expected benefits form the compelling reasons to partner. The four primary reasons are (a) asset/cost efficiencies, (b) customer service, (c) marketing advantage, and (d) profit stability/growth. Although it is unlikely that the drivers will be the same for both parties, a sturdy partnership requires that they be strong for both (Lambert, Knemeyer, & Gardner, 2004).

The DoD partners to improve service to its customers—the warfighters—and to improve asset performance and cost efficiencies (Kobren, 2009). By employing the PBL strategy, DoD aims not only to better meet the needs of

the operational end-users by improving system performance and readiness, but to minimize the total system life-cycle costs and logistics footprints associated with those systems (DoD, 2007). On the other hand, firms are driven to partner with the DoD by the potential benefits of profit stability/growth and marketing advantage (Hypko, Tilebein, & Gleich, 2010). Profitability is enhanced by long-term volume commitments for products, services, or both (Gupta et al., 2010; Ng & Nudurupati, 2010; Noordewier, John, & Nevin, 1990).

Lambert et al. (1996) classify partnerships into three types, based on the level of commitment and integration of the relationships. Type I is a just-above-arm's-length relationship, Type III is the highest level of partnership. PBL programs are weapon systems-unique (DoD, 2013) so it could be argued that programs exist at all three levels (Geary & Vitasek, 2008). However, most PBL contracts between the DoD and the major defense contractors fit into the category of Type II partnerships, defined as follows: "The organizations progress beyond coordination of activities to integration of activities ... multiple divisions and functions within the firm are involved in the partnership" (Lambert et al., 1996, p. 3).

Risk

Inherent in any discussion of contracts is the sharing of risk. Firms are most concerned with financial risk, that is, ensuring that they will have enough business to realize an adequate return on investment (ROI). Vendors seek to ensure profitability and reduce financial risk through longer contracts, but also weigh their risks in determining the level of service they are willing and able to provide.

The government's prime concern is operational risk, or the ability to meet mission objectives (Doerr, Eaton, & Lewis, 2005). Contracting or outsourcing support puts certain aspects of the mission in the hands of the supplier, making the upstream of the supply chain of concern to the government (Giunipero & Eltantawy, 2004). Another aspect of risk in establishing a PBL is to ensure that the customer requirements (the demand side of the supply chain) can be met by the terms of the contract and the supplier (Wagner & Bode, 2008). The length of a contract that DoD is willing to grant is often directly related to the amount of operational risk assumed by the commercial support provider. Doerr et al. (2005, p. 180) propose that "when commercial sector vendors assume less (measurable) operational risk under a PBL contract, the term of that contract should be less." This implies that when vendors take on greater risk, the government should offer a longer contract. The DoD is also concerned with financial risk. Flexibility, affordability, and support-cost reduction are important aspects of PBL

(Boyce & Banghart, 2012; DoD, 2011; Randall et al., 2010). DoD contracting behavior is often tempered by the risk of being unable to divert funds when changes to the mission require the use of different weapon systems. Economic uncertainty and potential price adjustments are also taken into consideration by contracting officers who craft long-term deals (General Services Administration, Department of Defense, & National Aeronautics and Space Administration, 2005).

It is important to understand the impact that financial and operational risk has on PBL contract decisions. Doerr et al. (2005) posit that by lowering financial risks for the supplier, multiyear contracts enable those suppliers to accept greater operational risks. Long-term relationships are at the core of a successful PBL strategy because multiyear contracts may be the best incentive for vendors to provide the greatest weapon systems support possible (Keating & Huff, 2005). It is argued that firms may prefer long-term relationships with lower, but sustained profit generation versus short-term contracts with higher margins. "Profit earned over an extended period, however, is better aligned with the longer strategic goals of a firm, and therefore exerts greater influence on shaping contractor performance" (Stevens & Yoder, 2005, p. 32).

Advantages and Disadvantages of Long-Term Contracts

Intrinsic advantages and disadvantages accompany long-term contracts, whether they are in the public or private sectors. Monczka et al. (2008) summarized the literature, listing some rewards and drawbacks that organizations can experience when executing long-term contracts (Table 1).

TABLE 1. ADVANTAGES AND DISADVANTAGES OF LONG-TERM CONTRACTS

Potential Advantages:	Potential Disadvantages:
<ul style="list-style-type: none">• Assurance of supply• Access to supplier technology• Access to cost/price information• Volume leveraging• Supplier receives better information for planning	<ul style="list-style-type: none">• Supplier opportunism• Selecting the wrong supplier• Supplier volume uncertainty• Supplier foregoes other business• Buyer is unreasonable•

Note. Adapted from Monczka et al. (2008)

Contract Structure and Incentives

In addition to contract duration, consideration must be given to how the vendor will be paid and how to incentivize performance. DoD support contracts typically fall into one of two broad categories: Cost-Reimbursable or Fixed Price (General Services Administration et al., 2005).

While a *Fixed Price* contract guarantees that a vendor will be paid a set price regardless of the costs incurred, a *Cost-Plus* contract is expense-based: when the contractor completes the agreed-upon work, the compensation received is equal to costs plus a bonus (either award or incentive fees) provided that the expenses are allowable and reasonable. The major determinant in choosing between a Cost-Plus and a Fixed Price contract is the degree of pricing risk present in the support cost (Defense Acquisition University [DAU], 2013). Such risk is higher during the early phases of program development and deployment, when costs are less certain, thereby making Cost-Plus contracts more appropriate. In general, however, the contracting objective is to eventually achieve a Fixed Price contract in conformance with the PBL concept of buying defined outcomes at a defined price (DoD, 2013).

Consideration must also be given to the types of incentives that will be utilized in a PBL contract (Edison & Murphy, 2012). For vendors to earn the rewards associated with PBL incentives, they must meet or exceed the contractual metrics for performance and/or support (DAU, 2013), depending on specific contract requirements. For a more thorough discussion of contract structures and incentives, see Geary et al. (2008).

The Four Stages of PBL

The “Four Stages” is a method of classifying PBL arrangements according to their “level” of strategy implementation (Vitasek et al., 2006, p. 7). Stage 1 describes support at the component level, Stage 2 describes support at the major subsystem level, Stage 3 deals with the weapon systems platform level, and Stage 4 assures mission availability/support at the system level. The Four Stages are frequently used to describe the wide range of PBL possibilities and the potential evolution of such programs. While the Four Stages do not exist to provide any sort of prescription for PBL contract structure, the possibility of conceptual correlations between the different stages, and varying types and lengths of contracts warrant investigation.

Methodology

Research Design

This exploratory research utilized case studies of existing PBL programs and interviews with PBL experts to gain a greater understanding of those factors having a significant impact on contract type and length, the degree to which contract length has been an issue during implementation, and how this information can apply to future decision making. Case studies and SME interviews were selected as appropriate methods for this research because the study asked several “how” and “what” questions that required an exploratory investigation (Yin, 2009). Choosing the best contracting methods for PBL programs is often based on opinion and difficult to support with empirical data. Case studies provide insight into lessons learned by those involved with high-profile PBL initiatives. Data were gathered at two levels or units of analysis.

The first unit of analysis, the program level, incorporated a representative sample of PBL programs as case studies. Representatives of commercial programs, primarily at the system or platform level, were solicited for support among the Army, Air Force, and Navy. Interviews were conducted with



program personnel in both DoD and private industry. Analysis conducted at this level sought to reap historical information and expert opinions associated with PBL programs at their points of execution.

The second unit of analysis, the DoD level, incorporated an executive-level view of PBL implementation within government. Interviews were conducted with PBL SMEs not associated with specific programs to broaden the perspectives on contract length issues. An SME was defined as any government or private sector representative who had at least 5 years' experience working closely with, overseeing, or evaluating multiple programs. Most SMEs offered opinions based on conclusions they had drawn as a result of working on multiple programs, thereby adding a degree of veteran opinion.

A critical question regarding interviews is: how many interviews need to be conducted? The gold standard for determining this number is saturation (Guest et al., 2006). Saturation is the point at which additional interviews no longer provide fresh ideas or information (Creswell, 2014; Davis-Sramek & Fugate, 2007). This number is generally low, with a good approximate for qualitative research being 10 or fewer (Corbin & Strauss, 2008; Guest et al., 2006).

Data Collection and Analysis

The interview questions were designed to answer the investigative questions and illuminate the areas of PBL contract structure in which improvements might be made. Interview questions were divided into four sets, corresponding with the four categories of respondents:

1. DoD personnel associated with case study programs
2. Private industry personnel associated with case study programs
3. DoD PBL SMEs
4. Industry SMEs

Ultimately, six PBL programs were studied, resulting in interviews with 12 individuals. Additionally, interviews were conducted with six SMEs for a project total of 18 individuals. The specific programs studied and affiliations of personnel who contributed data to this research are listed in Tables 2 and 3.

TABLE 2. CASE STUDY PROGRAMS SELECTED AND ASSOCIATED PERSONNEL INTERVIEWED

PBL Program	Organizations Represented by Personnel Interviewed	Type of Contract ^a	Length of Contract ^b
C-17 Globemaster III Sustainment Partnership (GSP)	<ul style="list-style-type: none"> • U.S. Air Force Acquisition Program Office, Logistics Management • Boeing Company, Business Development Dept. 	Combination of Firm Fixed Price Award Fee and Cost Plus Incentive Fee	<ul style="list-style-type: none"> • PBL contract began in 1998 • Current contract period: 2004-2008 • 5-year base with 3 option years • Current Justification and Approval (J&A) lasts until 2011^c
T-45 Goshawk Contractor Logistics Support	<ul style="list-style-type: none"> • U.S. Navy, Naval Air Systems Command (NAVAIR), Logistics Management Integration Dept. • L-3 Communications Corp., Program Management 	Firm Fixed Price with Over & Above Contract Line Item Numbers & performance bonuses	<ul style="list-style-type: none"> • Current contract period: 2004-2008 • 1-year base with 4 option years
High Mobility Artillery Rocket System (HIMARS) Life Cycle Contract Support (LCCS) I/II	<ul style="list-style-type: none"> • Lockheed Martin Corp., Missiles & Fire Control • U.S. Army, LCCS Team, Precision Fires Rocket & Missile Systems Project Office 	<ul style="list-style-type: none"> • Firm Fixed Price with Incentive Fee • Cost-Plus Fixed Fee for contingency deployments 	<ul style="list-style-type: none"> • LCCS I covered 2004-2007 • LCCS II will cover 2008-2010 • 1-year base plus option years (both contracts)

TABLE 2. CASE STUDY PROGRAMS SELECTED AND ASSOCIATED PERSONNEL INTERVIEWED, CONTINUED

PBL Program	Organizations Represented by Personnel Interviewed	Type of Contract ^a	Length of Contract ^b
E-8 Joint Surveillance & Target Attack Radar System (JSTARS) Total System Support Responsibility (TSSR)	<ul style="list-style-type: none"> Northrop Grumman Corp., Aerospace Prime Contractor (3 personnel) 	Cost Plus Award Fee and Award Term	<ul style="list-style-type: none"> PBL contract began in 2000 as 1-year base with 5 option years J&A period of 22 years^c Contract years have been negotiated up to 2010 (award term)
F/A-18 Hornet F/A-18 Integrated Readiness Support Teaming (FIRST)	<ul style="list-style-type: none"> U.S. Navy, F/A-18 and EA-18G Program Office, Office of the Director of Logistics and Naval Inventory Control Point (NAVICP) 	Firm Fixed Price, current contract combines 2 contracts for NAVAIR & NAVICP	<ul style="list-style-type: none"> Current contract period: 2006-2015 5-year base with single 5-year option
F-117 Nighthawk Total System Performance Responsibility (TSPR) & Total System Support Partnership (TSSP)	<ul style="list-style-type: none"> Lockheed Martin Corp., Strategic Plans & Sustainment Integration 	<ul style="list-style-type: none"> Cost Plus Incentive Fee “Stabilized Funding” for first 8 years 	<ul style="list-style-type: none"> TSPR period: 1999-2006 (5-year base with 3 option years) TSSP period: 2007-2008

Note. ^aRefers to the contract's present or last documented form

^bDates refer to fiscal years

^cJ&A = Justification and Approval from Congress for sole source

TABLE 3. PBL SUBJECT MATTER EXPERTS INTERVIEWED

Organizational Affiliations of Participants	Department of Defense	Private Industry
	<ul style="list-style-type: none"> • Directorate of Innovation & Transformation, Headquarters United States Air Force 	<ul style="list-style-type: none"> • Booz Allen Hamilton, Inc.—Senior Associate
	<ul style="list-style-type: none"> • Naval Air Systems Command (NAVAIR)—Logistics Integration, • Naval Inventory Control Point (NAVICP)—Supply Chain Solutions Division * 	<ul style="list-style-type: none"> • Lockheed Martin Corp.—Corporate Focused Logistics
	<ul style="list-style-type: none"> • Air Force Materiel Command (AFMC)—Acquisition Logistics 	

* One interview conducted with two personnel at NAVICP

The subsequent analysis organized the data into the four categories based on the participants' affiliations. Responses for each interview question were consolidated, matched according to respective investigative questions, and examined for similarities and differences. This was achieved by searching for key words, themes, and implications communicated by the interview participants. Conclusions were drawn based on these apparent themes, common views, and key opinions of the interviewees.

Data Analysis and Findings

This section is organized around those investigative questions utilized during the case study interviews. Implications of these findings and their influence on the overall research question will be addressed in the conclusions and recommendations section.

Question 1: What types and lengths of PBL contracts have proven most successful and effective to date?

Interview participants at the program level were asked to express their (or their organizations') degree of satisfaction with the type and length of the PBL contract in question, and to assess the contract's effectiveness in the context of type and length. Interestingly, in all three cases where both public- and private-sector representatives were interviewed for the same program, both sides were in agreement on the suitability of the type and length of the contract, whether good or bad.

A consistently high level of satisfaction with contract length was found among programs that had contracts with a 5-year base, followed by option years or award terms.

Results for Contract Length

A consistently high level of satisfaction with contract length was found among programs that had contracts with a 5-year base, followed by option years or award terms. Respondents in these cases expressed that the contract length allowed for an appropriate amount of risk sharing and ROI. One interviewee noted that the option years strengthened the arrangement by allowing flexibility for contract changes while extending the agreement into the future. This was a recurring finding throughout the research. The most notable case of dissatisfaction from both government and contractor involved a contract with a 1-year base and 4 option years. They agreed it was too short, because it was limited to 5 years by the FAR requirements for service contracts. A 10-year contract consisting of a 5-year base with 5 option years was preferred. The government interviewee argued that the benefits of a longer contract would outweigh the costs and the contractor agreed, contending that a longer agreement would allow for more creativity in managing spares.

Results for Contract Type

A consistently high level of satisfaction with contract type was found among programs with Firm-Fixed Price (FFP) contracts, which supports the idea that FFP is the desired end-state for PBL contracts. One contractor expressed some dissatisfaction with the current Cost Plus Award Fee contract structure on their program, noting that while these Cost-Plus style of contracts were appropriate in earlier years, the contract is now in its eighth year. Government personnel were unavailable to provide a DoD perspective, but the finding supports the expectation that PBLs should ideally transition from Cost-Plus to Fixed Price.

Of particular interest are the Cost Plus Incentive Fee (CPIF)-based PBL contracts for the F-117. These contracts, while CPIF, are also Total System Performance Responsibility (TSPR) contracts. The TSPR concept gives the contractor greater responsibility not only over design and engineering, but operational support as well (Loudin, 2010; White, 2001). A criticism of TSPR from the Air Force's perspective is their "must pay" nature (General Accounting Office [GAO], 2000, p. 12). TSPR contracts call for stabilized funding, requiring the government to obligate funds at the beginning of each year. While this was beneficial to the contractor, many within the Air Force considered it a mistake—the clause essentially created a bill that had to be paid in full even if operational requirements changed the use and/or amount of funding directed towards a TSPR program, making other programs without similar arrangements absorb cuts (GAO, 2000). However, in the instance of the F-117, Lockheed Martin used this stabilized funding to successfully reduce costs over the long run, and when the follow-on contract was created, it continued in the same manner (Hunter, 2000). The must-pay bill issue is still prominent in PBL contract structure discussions using WCF, and the arguments and suggested solutions concerning this issue are further discussed in the results for investigative question No. 4.

Question 2: What risks and other criteria most frequently play a role in determining PBL contract type and length?

Responses pertaining to this investigative question varied greatly, which created difficulties in conclusively identifying which criteria have the greatest influence. Table 4 lists all of the issues that interviewees cited as either having influenced contract structure or having the potential to influence contract structure.

TABLE 4. FACTORS THAT INFLUENCE PBL CONTRACT TYPE AND LENGTH		
Factors for Government	Factors for Contractors	Factors for Both
<ul style="list-style-type: none"> • DoD budgeting process—significant changes in operations may need to be addressed annually • Precedents set by past PBL programs • May need to rely on Original Equipment Manufacturer because there are no organic support options • Best value of cost vs. performance 	<ul style="list-style-type: none"> • Risk of underbidding and getting stuck with an unprofitable contract • Reputations at stake—performance may be more important than short-term profitability in order to earn future business • Setting up a support infrastructure (personnel & installations) requires significant investment • General risks: <ul style="list-style-type: none"> ◦ System reliability trends ◦ Obsolescence ◦ Program stability ◦ Profit margins ◦ Inflation ◦ Overall relationship with customer 	<ul style="list-style-type: none"> • Newness of program/contract (are requirements/costs clear?) • Lack of historical data for system • Risks associated with rapid changes in environment and material costs • Risks associated with accuracy of demand forecast • Contract length can be an enabler for affordability improvements • Cash-rich contractors can afford to take risks when government funding doesn't come through as expected

Question 3: In general, are contracts adequately structured to consistently meet the PBL goal of establishing long-term partnerships?

By and large, case study interview participants classified their associated programs as long-term partnerships and had positive views of the programs in this regard. Participants from both sides acknowledged the need to make commitments and share both risks and rewards.

Question 4: In general, are PBL contracts adequately structured to consistently provide incentives for contractors to make cost-reducing investments in system support?

Interviewees expressed a wide range of views concerning individual contracts' levels of effectiveness in meeting these PBL goals. The satisfaction with investment incentives was highest among programs that had multiple guaranteed contract years or guaranteed funding. Suppliers with shorter or less guaranteed contracts expressed that investment incentives were lacking. In most cases, ROI did not seem to be a significant issue because defense contractors will rarely enter into contracts with the government that are unprofitable, even if they are not as lucrative as would be preferred.

One SME expressed his belief that while the government has done a good job of incentivizing performance in the short term, it has not found a way to truly incentivize cost reduction over time.

One significant comment was offered by a representative for a major program who suggested that the two biggest enablers for vendors to accomplish weapon systems affordability improvements are long-term contracts and price-based (vs. cost-based) contracts. This would suggest that it is in the government's best interest to work towards long-term, Fixed Price PBL contracts whenever possible.

Another contract incentive that has not been traditionally implemented, but has potential to result in greater affordability improvements is the concept of *profit sharing*. The government has recognized efficiencies achieved by contractors as opportunities to both lower costs and attempt to negotiate a lower price whenever possible. This tends to limit creativity and incentive for investment on the contractor's part because the government is the only party that enjoys the increased ROI. One SME expressed his belief that while the government has done a good job of incentivizing performance in the short term, it has not found a way to truly incentivize cost reduction over time. Profit sharing may be the key to solving this problem.

Question 5: In general, how satisfied are PBL experts in both DoD and private industry with the government's application of risk aversion in PBL contracts?

Assessments of the government's risk aversion in PBL varied significantly among SME interview participants at the DoD level; while some government representatives thought risks had been appropriately addressed on both sides, others (both government and industry) felt the government was too risk-averse and that risk sharing had been ineffective. The majority expressed dissatisfaction with the government's risk aversion in PBL contracts. One industry executive claimed that "virtually all PBLs are successfully achieving their objectives and saving life-cycle costs for the government, and the process for performing business case analysis as a precursor for award is torturous." He suggested that the DoD's risk aversion has kept PBL from becoming a more prevalent contracting strategy. Another senior industry representative suggested that there is not enough due diligence in government to fully understand the risk profiles that contractors are taking on, noting it is worth understanding because sometimes the contractor isn't taking on much risk.

Several results from interviews conducted at the program level were applicable to the topic of risk aversion. There was considerable acknowledgment from both DoD and industry that risks must be shared for PBL contracts to be effective. Notably, this was mentioned repeatedly as a success factor for two of the high satisfaction programs. In contrast, an industry representative for another program felt that while risk sharing was sufficient in the early years of the contract, the government was now showing a little too much risk aversion in its reluctance to give serious consideration to a Fixed Price contract. Risk is best summarized by one industry representative who commented that crafting a PBL contract is "really all about risk sharing."

Question 6: Would any significant benefits be gained if the maximum contract length allowed by the FAR were increased?

In the cases under consideration, of the eight individuals who were asked whether or not FAR limitations had affected program contract lengths, five indicated that the FAR was irrelevant. Two of the respondents who believed the FAR had limited contract length were associated with a program that was classified as a service and thus was prevented by the FAR from attaining the desired "5+5" structure (5 years plus five 1-year options). For further discussion on these limitations, see Edwards (2003).

Several SMEs asserted that their on-the-job experience yielded little evidence to suggest any real need to change the contract length limitations in the FAR; PBL goals can and are being accomplished using initial base contracts of 5 years or less. One private industry authority expressed that the FAR limitations are indeed relevant, but not as important as the funding limitations associated with the 1-year operations and maintenance (O&M) money that is used to fund major PBL efforts.

The Emerging Problem

A recurring finding throughout the research was that the real issue was not the limitation on the number of base years for a PBL contract, but a lack of guaranteed funding during those years. This seems to represent what industry wants most out of PBL deals, but it is something the government can't truly provide using current practices. The concept of PBL says that a longer contract is better, but reality dictates that funding will only be approved annually, and this limits implementers' ability to get the full potential out of PBL. Clearly, most defense contractors seek to achieve FFP contracts that are guaranteed over several years. The government also benefits from FFP contracts, but struggles to guarantee them for longer than a year at a time because military requirements can change rapidly, and Congress reacts with annual changes to the defense budget. Unfortunately, Congress is not likely to change its funding methods in the near future, so PBL contract builders can expect to continue to face the challenge of creating long-term deals with fiscal uncertainty.

Question 7: Are award term and option year contracting strategies being used effectively, and should their use continue in a lesser, similar, or greater capacity?

Award terms create an obligation for the government to extend a contract if the specified conditions are met, whereas option years give the government the choice to extend regardless of performance. This study found that while most programs have used option years, only Air Force contracts seem to have used award terms. While the distinction does exist in practice, it seems to be a distinction without a difference. Despite the fact that award terms (and options) are not guaranteed, it was found that they provide incentives to contractors to perform well in the long run. One SME asserted that award terms can be effective because keeping business is a very strong incentive; once a revenue stream is established, firms don't want to lose it. A DoD SME believed that while the award term can be an effective tool, it "needs to be tied to better cost-reduction incentives."

This research uncovered no instances in which award terms/option years were needed to provide the government with a way out of a PBL deal gone bad.

Guidance for PBLs consistently points to award terms and option years as off ramps for the government in big PBL contracts, giving the government a way out if the contractor is failing to meet performance standards or price. Obviously, contractor performance is central to the decision to continue a PBL contract. This research uncovered no instances in which award terms/option years were needed to provide the government with a way out of a PBL deal gone bad. Interestingly, even among the examples given, the reasons for contract termination did not include bad performance on the part of the contractor.

Question 8: Should WCF be used more extensively in PBL programs across DoD?

According to those interviewed in the case study, WCF have been used to fund supply support for PBL programs in various parts of DoD—most extensively by the Navy. When applied, WCF have successfully allowed longer PBL contracts; however, they have restrictions on where they can be used and therefore do not seem to be recognized as a widespread strategy for lengthening contracts.

Most SMEs agreed that WCF are best suited for use at the subsystem or component level. An Air Force interview participant assessed that the Navy has made the use of PBL more straightforward by cordoning off some WCF money to be used on PBLs classified as supply contracts. He maintained that the Air Force is learning how to use these funds more effectively and that the Air Force WCF will be used in more PBLs in the near future, especially with proposals such as the fenced funding described under investigative question No. 6. Most experts expressed a belief that the Air Force and Army have room for improvement in the use of WCF for PBL, and that the Air Force has taken steps in that direction (no assessment of the Army was provided). The research did not reveal the utilization of WCF to be at the heart of PBL

contract structure issues, however. Most expressed the belief that questions about what is achievable and affordable, and which contracting approach is best suited to the task were of greater importance.

Question 9: Does a PBL agreement's place among the Four Stages of PBL have any impact on contract length decisions?

This research found little evidence to suggest that any direct link exists between contract length and where a PBL fits within the Four Stages. The DoD SMEs interviewed did not believe that the Four Stages had much impact on contract decisions. One stated that the “Four Stages don’t properly express what’s being done” in PBL, and another pointed out that because “there is little real benefit from PBL in the short term,” PBL should address long-term sharing of risks and costs regardless of the level at which it is implemented.

One industry SME believed that programs entailing higher levels of complexity, such as platform-level responsibility, require more long-term commitment, while material management support contracts that require little to no investment do not need to be long term. This suggests that the length of commitment from both parties in a PBL agreement should increase in proportion with the stages of implementation. While this is a logical assumption, PBL contracting behavior does not necessarily support it. Supply support contracts enacted at the Stage 1 or 2 level are not only typically less risky than Stage 3 contracts, but can also usually draw income from WCF, which allows for longer contracts. A general consensus among those interviewed was that no Stage 4 PBL has ever truly been implemented.

The most interesting finding repeated by most interviewed is that the Four Stages concept is misperceived in the acquisition and contracting communities, and that contrary to popular belief, PBLs should not strive to move up to the next stage in this supposed PBL evolution. Stage 4 is often presented as a goal for which all PBL programs should strive. Vitasek et al. (pp. 7–8, 2006) describe the Four Stages model as “a tool for program managers in charting a path to extend their PBL strategies to higher levels and broader scope,” but as several interviewees agreed, nothing is inherently wrong with an effective Stage 1 PBL. Higher stage PBLs are difficult to implement, and when a lower stage PBL has been properly implemented, the warfighter is better off as a result. Attempting to move such a program to the next level may not be necessary or achievable.

Conclusions and Recommendations

The conclusions and recommendations are divided into three sections. The first section brings together the research findings and examines how they can be used to answer the overall research question. The second section discusses limitations that were encountered in this research, and the third section puts forward some recommendations for future research and answers the research question:

How can the Department of Defense ideally balance PBL contracts to mitigate operational and financial risks while simultaneously building long-term partnerships that encourage investment from commercial contractors?

This research sought to draw conclusions about how the DoD can achieve the balance depicted in the research question. Ultimately, the findings gleaned from the authors' research revealed five main areas where efforts for improvement should be concentrated:

1. Congressional funding methods are not compatible with PBL.
2. Option years provide flexibility today; flexible performance may be the solution for tomorrow.
3. Improve incentives with increased use of profit sharing.
4. Long-term contracts aren't always the answer...but they usually are.
5. Keep working towards fixed price/price-based contracts.

The DoD simply cannot always guarantee the funding levels that would allow it to commit to long-term contract periods.

Congressional Funding Methods Are Not Compatible with PBL

As discussed previously in this article, the annual allocation of funds (primarily O&M) creates difficulties for implementers of PBL. In fact, the findings of this research suggest that it is the single biggest challenge facing those who seek to craft PBL contracts consisting of multiple guaranteed contract years. The DoD simply cannot always guarantee the funding levels that would allow it to commit to long-term contract periods. Other methods are being explored for funding PBL in such a way that mitigates the risk of budget fluctuations, such as fencing off money within the Services to be used for PBL programs. If significant changes in PBL funding methods were to take place, they could eventually force changes to contract length limitations in the FAR, which currently do not appear to have a widespread impact on PBL contracts. Alternate funding methods for PBL are controversial, however, and it is not reasonable to expect that Congress will alter its O&M funding methods in the near future. Therefore, for now, PBL officials must use other methods to build funding flexibility into contracts, such as option years, award terms, and flexible performance metrics.

Option Years Provide Flexibility Today; Flexible Performance May Be the Solution for Tomorrow

Option years and award terms are typically described as providing the government with off ramps in a PBL contract, giving the government a way out if the contractor is not performing adequately. While contractor performance is important to decisions to extend PBL contracts, this description does not seem to reflect the way option years and award terms are being used. This research failed to find an instance of a PBL program in which the DoD needed a way out due to performance. This finding, combined with the history of the DoD's relationships with major defense contractors, suggests that the risk of a contractor underperforming in a PBL arrangement is rather small. Its use then, suggests another rationale: optional contract years provide the government with the flexibility it needs to make adjustments based on budget fluctuations. When option years and award terms are negotiated, the government has the opportunity to make changes to the contract as a response to changes in funding. Therefore, option years/award terms provide one method of building flexibility into PBL contracts.

Considering that the option year and award term concepts were devised with intentions other than those for which they are primarily being employed, it would be wise to explore other





options for making PBL contracts financially flexible over the long run. One suggested alternative is the concept of flexible performance. Utilizing flexible performance metrics, PBL contracts can be written to accommodate unexpected fluctuations in operational requirements and funding, eliminating the government's fear of being penalized for funding reductions that affect a long-term contract. Put simply, flexible performance provisions allow contractors to deliver less performance when the DoD needs to pay them less money. Changes in performance delivered are measurable, meaning that they are directly proportional to changes in funding, and allow program managers in both the public and private sectors to predict how much performance will decline as a result of an anticipated reduction in funds. This is an advantage that typically cannot be found in non-PBL programs, and should be leveraged as a means of allowing longer contracts where they are needed.

Improve Incentives with Increased Use of Profit Sharing

Effective partnerships require the sharing of both risks and rewards. While risk sharing is understood to be at the core of PBL relationships, reward sharing seems to have received less attention. Because the government has historically recognized efficiencies achieved by contractors as opportunities to lower costs (primarily in Cost-Plus situations), contractors have often had little incentive to make creative improvements and investments in sustainment because only the government enjoys the return. In contrast, when contractors improve efficiencies that result in profits in some fixed-price situations, the government may see performance improvements, but not cost reductions. If PBL contracts more frequently included provisions for profit sharing between the DoD and private vendors, benefits may be realized by both parties. Because profit sharing benefits everyone and is conceptually well-suited to the mutually beneficial partnerships that PBL agreements claim to be, it would seem that financial returns on improvements should be shared whenever feasible.

Long-Term Contracts Aren't Always the Answer...But They Usually Are

Because PBLs are tailor-made to fit requirements of different types of programs, it is difficult to make generalizations about ideal contract length. Nonetheless, it cannot be denied that long-term contracts are at the heart of PBL strategy. While no universally agreed-upon definition exists of "long-term" in the PBL context, this research found in practice the term refers to agreements of 5 years or more. PBL programs in the DoD have attained substantial success in the

execution of contracts that consist of 5 base years plus 3 to 5 option years or award terms (Kratz, 2007). This type of contract length has many benefits, including:

- Long-term agreements strengthen the partnership between the DoD and private industry.
- When combined with the right contract type, contractors have more incentive to invest in logistics support for systems, enabling affordability improvements.
- Contractors see opportunity for greater ROI.
- Labor is not expended rewriting the contract from year to year.

Some drawbacks are associated with this contract structure as well, the most prominent of which is the loss of flexibility during the initial guaranteed years to deal with fluctuating budgetary requirements. In some instances, both parties cited the shorter contract as ideal due to unique circumstances. But in general, data indicate that commitment to long-term contracts produces effective performance-based partnerships, and that the government's reliance on original equipment manufacturers for weapon systems sustainment tends to be drawn out over many years. Therefore, whenever possible, PBL implementers should strive for something that resembles a 5+5 contract structure.

Keep Working Towards Fixed Price/Price-Based Contracts

This research supports the notion that whenever possible, PBL implementers should strive to achieve a Fixed Price contract for their programs. The success of programs with some form of Fixed Price demonstrates that this is a meaningful goal. Fixed Price contracts align with the PBL goal of purchasing a defined outcome at a defined price; they stabilize prices for the government while guaranteeing a specific level of revenue for vendors. In turn, this provides incentive for contractors to make affordability improvements to systems because money saved can be turned into profit. (Ways to make these improvements beneficial to both parties are discussed in the following section.) A long-term contract alone does not encourage a supplier to make investments; it must also have provisions that reward such behavior. As one commercial SME put it, "without a fixed price, a long contract only serves to reduce the contracting burden," meaning that less frequent contract revisions are the only notable benefit.

A Fixed Price contract can be difficult to accomplish; data that support a stable price are often difficult to gather and comprehend. If not properly planned for during cost-reimbursable stages of a contract, a Fixed Price contract may never be attained. Therefore, PBL implementers should keep the Fixed Price goal in mind from the inception of a PBL contract, and work towards it over time. Note that some elements of a PBL contract may not be suited for Fixed Price; therefore, the effort to reach a Fixed Price contract should not preclude keeping some elements of a contract in a Cost-Plus state.

Summary, Implications, and Limitations

PBL, while embraced by the DoD as a preferred strategy for weapon systems sustainment, remains a complex, and at times misunderstood, process. Improvements made to the way PBL contracts are structured can have significant impacts. This research addressed the question of how to balance PBL contracts to mitigate operational and financial risks while simultaneously building long-term partnerships that encourage investment from commercial contractors. Findings from the research suggested that improvements can be made in PBL by focusing (when applicable) on the five areas described in the previous paragraphs.

PBL, while embraced by the DoD as a preferred strategy for weapon systems sustainment, remains a complex, and at times misunderstood, process.

This research was constrained by certain limitations; specifically, accessibility of personnel and information limited the number of cases studied and personnel interviewed. Because both the PBL programs studied and the number of experts interviewed were greatly dependent upon the responsiveness of personnel contacted and their willingness to participate, the population in this study is represented by more of a convenience sample than a random sample. Given more time and/or resources, a broader, more

balanced study might provide a greater understanding of the issues, further substantiate the findings of this study, or suggest alternative conclusions not discussed in this study.

The very nature of PBL made it difficult to generalize results across the entire PBL spectrum. As discussed repeatedly, every PBL agreement is tailored to fit unique requirements, and because PBL is not a one-size-fits-all approach, it is difficult to make generalizations that can be applied to all programs. In addition, the different military Services seem to have differing philosophies about how PBL should be approached, and these differences become more complex when the different system levels (i.e., platform, subsystem, etc.) are factored in.

Lastly, the possibility of bias must be assumed: While interview participants attempted to give unbiased assessments of PBL issues, in some cases their opinions may possibly have been skewed by the perspectives of their organizations; that is to say, they may have highlighted what was in their organizations' best interest.

Recommendations for Future Research

A study of effective PBL contract structures and incentives that more clearly delineates between practices at the subsystem/component levels and practices at the platform level could prove beneficial. A comparison of best practices at the different levels could serve to identify whether the recommendations presented in this research should be generalized across all PBLs or whether they are appropriate only at certain levels of system support.

Similarly, a comparison of PBL contracting approaches among the Air Force, Army, and Navy may help to determine whether some contract-building strategies are best suited to specific branches of the military. Such a study could clarify the degree to which the generalizations presented in this research are applicable in each of the armed forces, or perhaps identify areas where the different Services should better align their methods.

Future research may also investigate how the recommendations presented in this study might best be carried out. Of particular interest would be an exploration of potential alternatives for PBL funding methods, or new ways to overcome the barriers that the current budgetary process creates.

References

- Acquisition Community Connection. (2013). *Performance based logistics community of practice: PBL overview*. Retrieved from: <https://acc.dau.mil/CommunityBrowser.aspx?id=527144&lang=en-US>
- Berkowitz, D., Gupta, J. N., Simpson, J. T., & McWilliams, J. B. (2004–2005). Defining and implementing performance-based logistics in government. *Defense Acquisition Research Journal*, 11(3), 255–267.
- Boyce, J., & Banghart, A. (2012, March-April). Performance based logistics and project proof point: A study of PBL effectiveness. *Defense AT&L*, 41(2), 26–30. Retrieved from: http://www.dau.mil/pubscats/ATL%20Docs/Mar_Apr_2012/Boyce_Banghart.pdf
- Corbin, J., & Strauss, A. (2008). *Basics of qualitative research: Techniques to developing grounded theory* (3rd ed.). Los Angeles, CA: Sage.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage.
- Daugherty, P. J. (2011). Review of logistics and supply chain relationship literature and suggested research agenda. *International Journal of Physical Distribution & Logistics Management*, 41(1), 16–31.
- Davis-Sramek, B., & Fugate, B. S. (2007). State of logistics: A visionary perspective. *Journal of Business Logistics*, 28(2), 1–34.
- Defense Acquisition University. (2013). *Defense acquisition guidebook*. Retrieved from <https://dag.dau.mil/Pages/Default.aspx>
- Department of Defense. (2007). *The defense acquisition system* (DoDD 5000.01) Washington, DC: Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics.
- Department of Defense. (2008). *Operation of the defense acquisition system* (Interim DoDD 5000.02). Retrieved from http://www.acq.osd.mil/asda/docs/dod_instruction_operation_of_the_defense_acquisition_system.pdf
- Department of Defense (2011). *Proof point project: A study to determine the impact of performance based logistics (PBL) on life cycle costs*. Retrieved from: [https://acc.dau.mil/adl/en-US/550258/file/68272/Final%20Proof%20Point%20Narrative%20Report%20\(30%20Nov%202011\).pdf](https://acc.dau.mil/adl/en-US/550258/file/68272/Final%20Proof%20Point%20Narrative%20Report%20(30%20Nov%202011).pdf)
- Department of Defense. (2013). *Performance based logistics comprehensive guidance* [Memorandum]. Washington, DC: Office of the Assistant Secretary of Defense for Logistics and Materiel Readiness.
- Department of Defense. (2015). *Operation of the defense acquisition system* (DoDD 5000.02). Retrieved from <http://www.acq.osd.mil/fo/docs/500002p.pdf>
- DeVries, H. J. (2004–2005). Performance-based logistics—Barriers and enablers to effective implementation. *Defense Acquisition Research Journal*, 11(3), 243–253.
- Doerr, K., Lewis, I. A., & Eaton, D. R. (2005). Measurement issues in performance-based logistics. *Journal of Public Procurement*, 5(2), 164–186.
- Edison, T. R., & Murphy, A. (2012). A new look at enablers and barriers to performance-based life cycle product support (PBL) implementation. *Defense Acquisition Research Journal*, 19(4), 376–393.
- Edwards, V. J. (2003). *The five-year limit on government contracts: Reality or myth?* Retrieved from <http://www.wifcon.com/anal/analfiveyear.htm>
- Fowler, R. T. (2009). Misunderstood superheroes: Batman and performance-based logistics. *Defense AT&L*, 38(1), 8–13.

- Geary, S., Koster, S., Randall, W. S., & Haynie, J. J. (2010). Performance-based life cycle product support strategies: Enabler for more effective government participation. *Defense Acquisition Research Journal*, 17(4), 450-483.
- Geary, S., & Vitasek, K. (2008). *Performance-based logistics: A contractor's guide to life cycle product support management*. Bellevue, WA: Supply Chain Visions.
- General Accounting Office (GAO). (2000). *Defense logistics: Air Force report on contractor support is narrowly focused* (Report No. GAO/NSIAD-00-115). Retrieved from <http://gao.gov/assets/230/229078.pdf>
- General Services Administration, Department of Defense, & National Aeronautics and Space Administration. (2005). *Federal acquisition regulation* (Vol. 1). Washington, DC: Author.
- Giunipero, L. C., & Eltantawy, R. A. (2004). Securing the upstream supply chain: A risk management approach. *International Journal of Physical Distribution & Logistics Management*, 34(9), 698-713.
- Glas, A., Hofmann, E., & Eßig, M. (2013). Performance-based logistics: A portfolio for contracting military supply. *International Journal of Physical Distribution & Logistics Management*, 43(2), 97-115.
- Goure, D. (2009, June 4). *Government-private sector partnerships are key to Pentagon efficiency*. Retrieved from http://www.upi.com/Top_News/Analysis/Outside-View/2009/06/04/Government-private-sector-partnerships-are-key-to-Pentagon-efficiency/UPI-54971244124515/
- Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, 18(1), 59-82.
- Gupta, J. N., Eagan, M. C., Jones, J. N., & Platt, J. C. (2010). *Contractor incentives for success in implementing performance-based logistics: A progress report*. Proceedings of the Seventh Annual Acquisition Research Symposium Wednesday Sessions: Vol. 1 (pp. 63-75). Monterey, CA: Naval Postgraduate School.
- Hunter, J. (2000). *Air Force F-117 performance based logistics PBL summary presentation* [PowerPoint slides]. Retrieved from: <https://acc.dau.mil/CommunityBrowser.aspx?id=46633&lang=en-US>
- Hypko, P., Tilebein, M., & Gleich, R. (2010). Benefits and uncertainties of performance-based contracting in manufacturing industries: An agency theory perspective. *Journal of Service Management*, 21(4), 460-489.
- Keating, S., & Huff, K. (2005). Managing risk in the new supply chain [performance-based logistics]. *Engineering Management*, 15(1), 24-27.
- Kim, S., Cohen, M. A., & Netessine, S. (2007). Performance contracting in after-sales service supply chains. *Management Science*, 53(12), 1843-1858.
- Kobren, B. (2009). What performance based logistics is and what it is not—And what it can and cannot do. *Defense Acquisition Research Journal*, 16(3), 254-267.
- Kratz, L. (2007). *Achieving actionable logistics*. Proceedings of the 23rd Annual National Logistics Conference and Exhibition (Vol. 21). Miami, FL: National Defense Industrial Association.
- Lambert, D. M., Emmelhainz, M. A., & Gardner, J. T. (1996). Developing and implementing supply chain partnerships. *The International Journal of Logistics Management*, 7(2), 1-18.
- Lambert, D. M., & Knemeyer, A. M. (2004). We're in this together. *Harvard Business Review*, 82(12), 114-122.
- Lambert, D. M., Knemeyer, A. M., & Gardner, J. T. (2004). Supply chain partnerships: Model validation and implementation. *Journal of Business Logistics*, 25(2), 21-42.

- Lemke, F., Goffin, K., & Szwejczewski, M. (2003). Investigating the meaning of supplier-manufacturer partnerships: An exploratory study. *International Journal of Physical Distribution & Logistics Management*, 33(1), 12–35.
- Loudin, K. H. (2010). Lead systems integrators: A post-acquisition reform retrospective. *Defense Acquisition Research Journal*, 17(1), 27–44.
- Mahon, D. (2007). Performance-based logistics: Transforming sustainment. *Journal of Contract Management*, 5(1), 53–71.
- Monczka, R., Handfield, R., Giunipero, L., & Patterson, J. (2008). *Purchasing and supply chain management*. Mason, OH: Cengage Learning.
- Ng, I. C. L., & Nudurupati, S. S. (2010). Outcome-based service contracts in the defence industry—Mitigating the challenges. *Journal of Service Management*, 21(5), 656–674.
- Noordewier, T. G., John, G., & Nevin, J. R. (1990). Performance outcomes of purchasing arrangements in industrial buyer-vendor relationships. *The Journal of Marketing*, 54(4), 80–93.
- Office of the Department of Defense Inspector General. (2006). *Logistics: Quality, integrity, accountability: H-60 Seahawk performance-based logistics program*. Retrieved from <http://www.dodig.mil/audit/reports/FY06/06-103.pdf>
- Ogden, J. A., Petersen, K. J., Carter, J. R., & Monczka, R. M. (2005). Supply management strategies for the future: A Delphi study. *Journal of Supply Chain Management*, 41(3), 29–48.
- Openshaw, S. T., & Riffle, R. (2006). *Performance based logistics: A path to reduced reliance on contractor technical support for weapon systems in the field?* Retrieved from <http://www.dtic.mil/dtic/tr/fulltext/u2/a461434.pdf>
- Randall, W. S. (2013). Are the performance based logistics prophets using science or alchemy to create life-cycle affordability? Using theory to predict the efficacy of performance based logistics. *Defense Acquisition Research Journal*, 20(3), 325–348.
- Randall, W. S., Nowicki, D. R., & Hawkins, T. G. (2011). Explaining the effectiveness of performance-based logistics: A quantitative examination. *The International Journal of Logistics Management*, 22(3), 324–348.
- Randall, W. S., Pohlen, T. L., & Hanna, J. B. (2010). Evolving a theory of performance-based logistics using insights from service dominant logic. *Journal of Business Logistics*, 31(2), 35–61.
- Starks, G. L. (2004–2005). Public and private partnerships in support of performance-based logistics initiatives—Lessons learned from Defense Logistics Agency partnerships. *Defense Acquisition Research Journal*, 11(3), 305–316.
- Stevens, B., & Yoder, C. (2005). Award-term contracts: Good for business? *Contract Management*. Retrieved from <http://hdl.handle.net/10945/42331>
- University of Tennessee (2012). *The tenets of PBL: A guidebook to the best practices elements in performance-based life cycle product support management* (2nd ed.). Retrieved from <https://acc.dau.mil/adl/en-US/550412/file/68356/Learning%20Asset%20PBL%20Tenets%20Guidebook%20Second%20Edition%20June%202012%20Final.pdf>
- Vitasek, K., Geary, S., Cothran, J., & Rutner, S. (2006, June). Keep your end customer in sight. *Supply Chain Strategy: A Newsletter from the MIT Supply Chain Lab*. Retrieved from <http://173.192.121.142/images/Users/1/PBL/News/KeepYourEndCustomerInSight.pdf>

- Wagner, S. M., & Bode, C. (2008). An empirical examination of supply chain performance along several dimensions of risk. *Journal of Business Logistics*, 29(1), 307-325.
- White, C. (2001). *An analysis of total system performance responsibility in Air Force acquisitions* (Master's thesis). Wright-Patterson Air Force Base, OH: Air Force Institute of Technology, Graduate School of Engineering and Management.
- Yin, R. K. (2009). *Case study research: Design and methods*. Thousand Oaks, CA: Sage.

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